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ABSTRACT

Conceptualizing Grade Inflation

Evidence of grade inflation in U.S. high schools is often misinterpreted due to confusion about how grade inflation is, or should be, defined. This note clarifies the implications of recent research on grade inflation in two ways. First, we situate the evidence by defining three distinct types of grade inflation. Second, we extend past research using data from North Carolina by documenting the different types of grade inflation experienced by high school students in the state over a recent ten-year period. Static grade inflation has been, and remains, higher in schools serving relatively disadvantaged student populations; however, differential growth in grade inflation in schools serving relatively advantaged student populations over the past 10 years has significantly narrowed this SES-based gap in grade inflation.

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1. Introduction

The history of schools using letter grades to measure academic performance dates back at least 100 years (Durm 1993). Grades matter, as they facilitate job and internship opportunities as well as admission to selective colleges and universities. Grades also provide information to students, parents, and school administrators about areas of strength and areas for improvement. However, the value of grades to students and to the firms and schools that rely on grades to make inferences about student quality lies in everyone's ability to interpret the meaning of a grade.

Unfortunately, the meaning of grades is often unclear, as evidenced by the ubiquity of the term *grade inflation*. Indeed, an internet search of the term generates almost 48 million hits and about 340,000 academic articles and books have been published on the subject, including nearly 40,000 in the past four years. This burgeoning interest and concern about grade inflation is warranted by grades' importance in modern educational and labor markets and the potential for differences in schools' grading practices to contribute to existing socio-demographic gaps in educational and labor-market outcomes.

Two recent studies document that while grade inflation has increased over the past several years, this growth has been concentrated in schools serving relatively advantaged students (Gershenson 2018; Hurwitz & Lee 2017). This has led to some confusion about the current status and implications of grade inflation that we aim to address in the current note. The confusion is due to different notions of what grade inflation is and how it should be measured. Accordingly, we introduce and define three distinct types of grade inflation: *static*, *dynamic*, and *differential*. Researchers and practitioners should be clear about what type of grade inflation they are estimating, reporting, and generally concerned with. We then extend Gershenson's (2018) analysis of grade inflation among North Carolina's public-school Algebra-I students to provide examples of each type of grade inflation and to clarify that while grade inflation has been increasing in relatively advantaged schools over this time period, in an absolute sense grading standards remain lower in relatively disadvantaged schools.

2. Conceptualizing Grade Inflation

In macroeconomics, inflation is measured as a *rate* that refers to the percentage change in prices over a given period of time. This requires fixing an arbitrary base year from which to make the comparison. The macroeconomic concept of inflation is inherently *dynamic*: how does the price of a fixed basket of goods change over time? Grade inflation could be, and often is, viewed as a similarly dynamic phenomenon: has the knowledge of an "A student" changed over time?

However, education stakeholders frequently consider two other types of grade inflation. First, at a *static* point in time, they may generally wonder about grading standards at a given point in time; i.e., what level of content mastery does an "A" typify? This is roughly analogous to the notion of nominal prices in macroeconomics. Second, in either a static or dynamic setting, they may wonder whether the relationship between grades and performance is different (or changing at differential rates) for different subgroups of students. This *differential* grade inflation is analogous to the concept of "inflation inequality" whereby low-income Americans experience higher rates of inflation than their wealthier counterparts (Jaravel 2019; Wimer et al. 2019).

To avoid confusion in discussions concerning grade inflation, then, we should clearly distinguish between three types of grade inflation:

- Static: grades overstate student performance at a fixed point in time
- Dynamic: relationship between grades & performance changes over time
- Differential: relationship between grades & performance varies by school/student type

2.1 Static Grade Inflation

Static grade inflation occurs when grades overstate students' content knowledge or academic performance. For example, Gershenson (2018) shows that in the aggregate, 19% of Algebra-I students who received As and 57% of students who received Bs failed to score "college and career ready" and 8% of students who received an A and 36% of students who received a B failed to score proficienty on the end of course (EOC) exam. Although exams are imperfect and noisy measures of content mastery and some students might have faced extenuating circumstances that caused them to underperform, these numbers suggest a disconnect between grades and content mastery at a given point in time.

2.2 Dynamic Grade Inflation

Dynamic grade inflation occurs when the level of content mastery or knowledge associated with a given grade deteriorates over time. For example, Hurwitz and Lee (2017) show that high school GPAs increased markedly from 1998 to 2016 while SAT scores decreased over the same time period. To the extent that SAT scores are a more objective, albeit imperfect, measure of ability this implies that the degree to which grades overstated actual content knowledge increased during this time. This is troubling because those who rely on the information provided by student grades cannot know how to interpret it at a given point in time.

2.3 Differential Grade Inflation

Differential grade inflation occurs when the mapping between knowledge and grades varies by student background or school type. Differential grade inflation can occur in in either a static or dynamic environment. For example, as we show in section 3.2, static grade inflation is more pronounced in schools serving relatively disadvantaged populations. However, these differences can change over time too (Gershenson 2018; Hurwitz and Lee 2017). For example, one of the main results in Gershenson (2018) is that since 2010, grade inflation significantly increased in more affluent schools but remained relatively flat in less affluent schools. This result was interpreted by many to mean that grade inflation was higher in such schools in an absolute sense. However, this is not necessarily true because looking only at dynamic grade inflation ignores the differences in static grade inflation at baseline. The existing literature has not yet examined the extent of differential static grade inflation or the way differential dynamic grade inflation has altered differential static grade inflation over time; we address this gap in section 3.

3. Differential Grade Inflation in North Carolina's Algebra I Classrooms

3.1 Data

We analyze student-level administrative data obtained from the North Carolina Education Research Data Center (NCERDC) that include course grades and EOC standardized test scores for nearly all public-school students in the state who took Algebra I between 2005 and 2016 (we refer to school years by the year of the spring semester). This yields about 750,000 complete cases. Grades come from transcript files, which provide either a numeric or letter grade. We ignore plus and minus signs and define grades as follows: A as 90-100 course points, B as 80-89, C as 70-79, and D or F as 69 or fewer. EOC scores are standardized by year to have mean zero and standard deviation (SD) one to allow for comparisons over time, as score scales occasionally changed. These are the same data analyzed in Gershenson (2018), to which we refer the interested reader for additional detail.

3.2 Static Differential Grade Inflation

Gershenson (2018) finds suggestive evidence of static grade inflation in North Carolina's Algebra I classrooms between 2006 and 2016. The large share of students who receive good grades yet perform poorly on the EOC suggests that the "good grades" of As and Bs do not indicate anything approaching mastery of the course material. However, the author did not test whether this form of static grade inflation varied by the SES of the school's student body.

In figure 1, we test for differential static grade inflation by using EOC scores to predict the probability of receiving an A in more and less advantaged schools, which are identified by whether more than 50% of the student body is eligible for free or reduced-price lunch. Our predictions come from probit models that include a cubic function of the EOC score. EOC scores were standardized to have mean 0 and SD 1, so we plot these predicted probabilities for scores ranging from -2 to 2 SD from the mean. For scores below 0, there is no significant difference in the probability of receiving an A between more and less affluent schools, which is in part due to the low frequency of As among students who score below average on the EOC. However, for scores above zero, statistically significant differential grade inflation emerges and slightly increases with scores. Specifically, for a given EOC score above the mean, students in relatively disadvantaged schools are about five to ten percentage points more likely to receive an A than their counterparts in relatively advantaged schools.

3.3 Dynamic Differential Grade Inflation

A headline result of both Gershenson (2018) and Hurwitz and Lee (2017) was that grade inflation had increased since 2010, but only in relatively advantaged student populations. Both studies reached this conclusion by regressing grades on a function of standardized test scores along with full sets of year and school fixed effects, where the year fixed effects were the parameters of interest. This provocative result led many observers to conclude that grade inflation was higher in high-SES schools *in an absolute sense*, and thus that these students were at yet another advantage in the competition over spots in the nation's elite colleges and universities. However, this interpretation ignores the fact that static grade inflation of the type defined in section 3.2 was initially higher in less advantaged schools; it is thus unclear whether the dynamic differential grade inflation uncovered in these studies was great enough to erase the differential grade inflation that existed at baseline. Once again, this highlights the importance of clearly defining the type of grade inflation being studied—and to maintain the macroeconomic analogies—the importance of distinguishing between stocks and flows.

Figure 2 aims to answer this question and demonstrate the importance of defining the various types of grade inflation by presenting year-specific differences by school SES in static grade inflation. The differential static grade inflation in each year is simply defined as the difference in the probability of receiving an A in Algebra I for a given Algebra-I EOC score between relatively disadvantaged and relatively advantaged schools (so a positive value reflects higher grade inflation in more disadvantaged schools). Probabilities are generated by probit models that condition on a cubic function of students' standardized EOC scores. To allow for heterogeneity by student ability, we conduct this exercise three times, for students well above, near, and well below the average EOC score of 0.

The dashed line in Figure 2 reports these differences, annually, for students scoring within 10% of a SD of the mean test score. There is a marked shrinking of this gap over the ten years under study, from more than ten percentage points in 2005 to about two percentage points in 2016. This narrowing of the gap is consistent with the aforementioned growth in grade inflation in high-SES schools over time. However, for these students in the middle of the test score distribution, grade inflation remains higher in schools serving relatively disadvantaged populations.

The dotted and solid lines similarly report annual SES-based differences in grade inflation for students who scored more than, and less than, one SD from the mean, respectively. Both trends show similar patterns of a shrinking SES difference in grade inflation. Specifically, the dotted line shows that among students scoring more than one SD above average on the EOC, the difference between low- and high-SES schools in the chances of receiving an A fully closed from 6 percentage points in 2005 to about 0 in 2016. The solid line shows that among low scorers, the gap is much smaller but it too has recently trended towards zero; the lack of a gap in this group is intuitive, as the chances of receiving an A when EOC scores are more than one SD below the average are small for everyone.

4. Conclusion

Grade inflation is often an ill-defined concept. This note introduces a typology of grade inflation and demonstrates the confusion that can arise when analysts and observers are not clear about the type of grade inflation under consideration. We use the example of Algebra I courses in North Carolina, previously studied in Gershenson (2018), to clarify that recent bouts of *dynamic* grade inflation observed in schools serving relatively advantaged student populations narrowed existing *static* differences in grade inflation between schools serving more- and less-advantaged students. In other words, the recent grade inflation observed in more advantaged schools allowed them to catch up to the level of grade inflation already present in their less advantaged counterparts.

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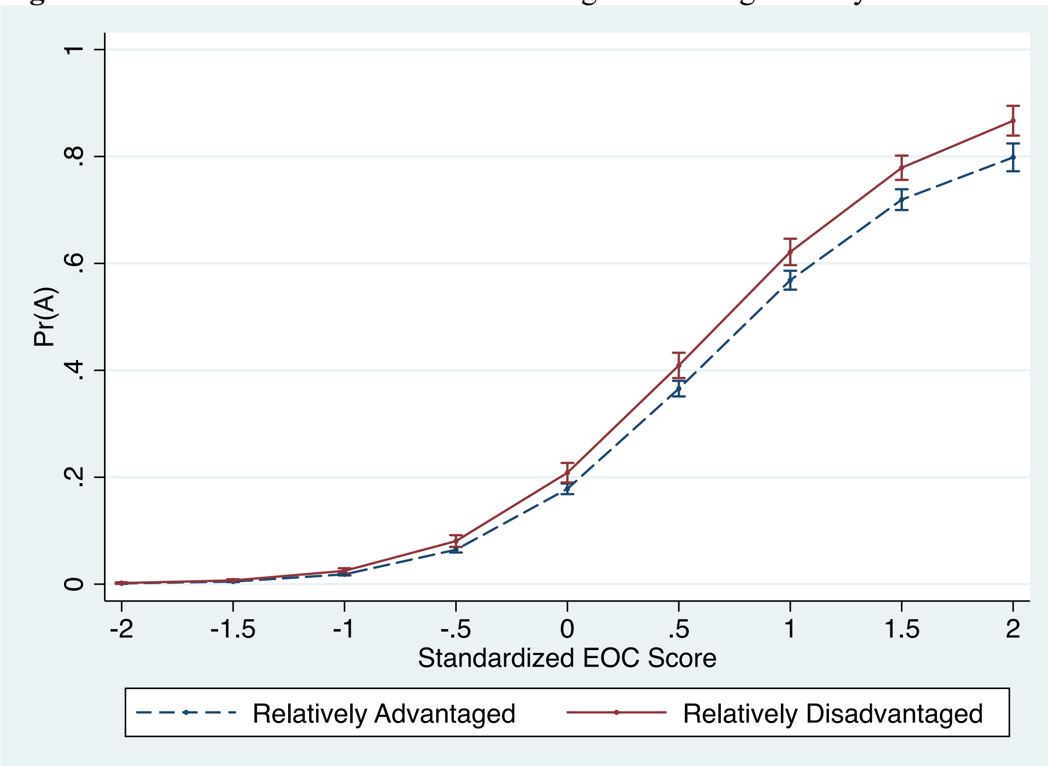
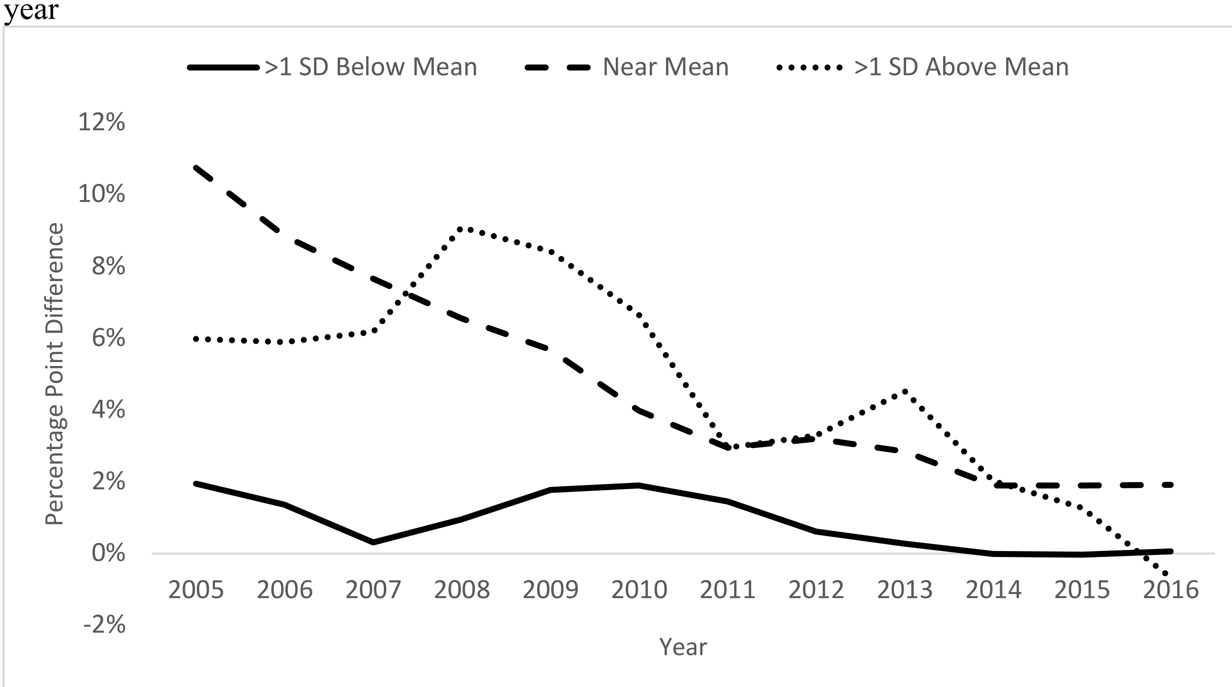
Figure 1: Predicted Probabilities of Receiving an A in Algebra I by EOC Score



Notes: End of course (EOC) scores are standardized by year to have mean 0 and standard deviation 1. Predictions are generated by probit models that include a cubic of the EOC score and were estimated separately for schools in which more / less than half the student body was eligible for free or reduced-price lunch. Error bars are 95% confidence intervals that are robust to clustering by school.

Figure 2: School SES Gaps in Probability of Receiving an A in Algebra I by EOC score and year



Note: EOC = End of Course exam. Positive values indicate higher probability of receiving an A in less-advantaged schools (i.e., schools in which more than half the students were eligible for free or reduced-price lunch).